Technical and Specification Information

Greensource air to
water heat pump series

Greensource air to water heat pump series

Building Regulation G3 compliant

WORCESTER
Bosch Group

Worcester, Bosch Group
Technical Help line

Worcester and you. Making a difference.

Working together for many years, heating professionals and Worcester have been making a real difference in hundreds of thousands of homes across the UK. We are recognised as a market leader in high efficiency, condensing boiler technology and are also committed to providing renewable energy solutions.

As part of the Bosch Group, our products are designed and manufactured to provide the high levels of quality and reliability which are synonymous with the Bosch name throughout the world.

We're a leading British company, employing more than 1,800 people at our headquarters and manufacturing plants in Worcester and at Clay Cross in Derbyshire, including a nationwide network of over 300 Service Engineers and over 80 technically-trained Field Sales Managers.

As part of Europe's largest supplier of heating products, Worcester, Bosch Group has the UK-based resources and support capability to offer you the value-added solutions we feel you deserve.

"At Worcester we recognise the vital role you, our customer, has in the specification and installation of 'A' rated, energy efficient appliances in homes across the UK. We will continue to invest in our products, people, facilities and added value services such as training, to give you the support you require in providing a total solution for your customers' comfort."

Richard Soper,
Managing Director, Worcester, Bosch Group

BOSCH
Invented for life

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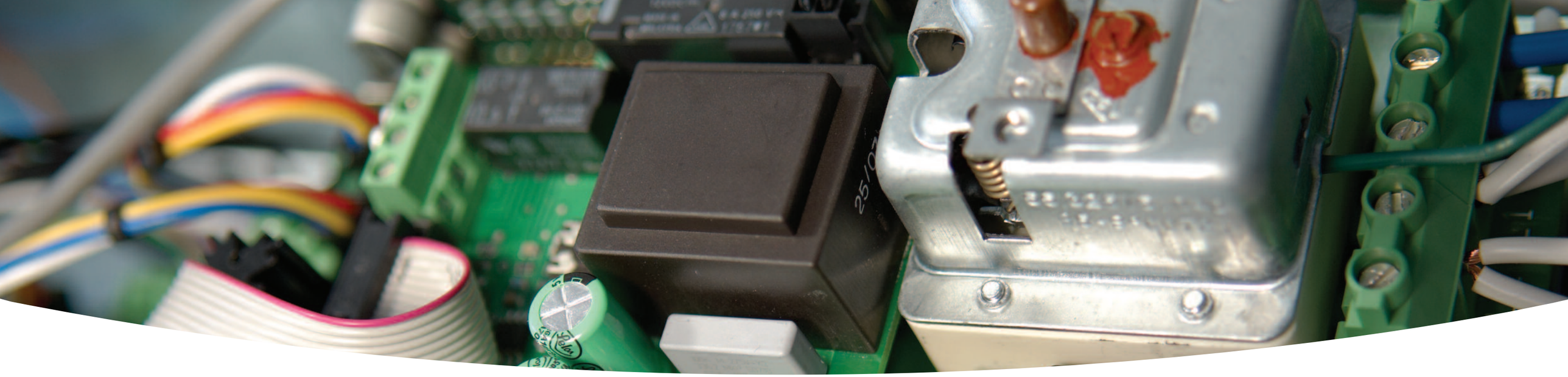


The Greensource air to water heat pump series

Advanced renewable energy technology from Worcester that's leading the way to a greener and more sustainable future.

As part of the Bosch group, Worcester is committed to environmental protection. Product development is prioritised in the interests of people's safety, the economical use of resources and environmental sustainability.

In just a few short years, Britain's domestic heating and hot water industry has changed dramatically.

With approximately 25% of the UK's carbon dioxide emissions being produced by home energy consumption, 75% of which is for the provision of heating and hot water, such change has been not only inevitable but crucial.

Words and expressions such as "renewable energy", "sustainable technology" and "carbon footprint" have become part of everyday conversation and have been fuelled by extreme weather and stark television images of melting polar ice caps.

Worcester, Bosch Group has taken the lead in developing heating and hot water solutions which reduce the impact on the environment by reducing harmful CO_2 emissions, while continuing to satisfy the daily demand for domestic heating and hot water comfort – not only for today, but well into the future.

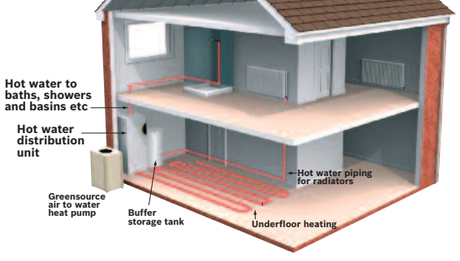
With this in mind, Worcester is proud to offer a range of G3 compliant air to water heat pumps which allow the consumer to take advantage of renewable and sustainable energy.

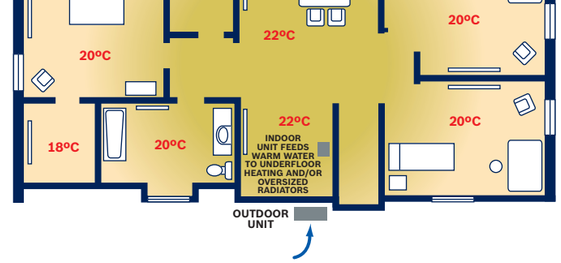
As well as being fuelled by the free and inexhaustible supply of latent energy, Worcester air source heat pumps offer additional advantages including simple and cost-effective installation, suitability for a wide variety of property types and sizes and, at a time when fuel costs are rising, the chance to help your customers reduce their heating and hot water bills.

The appliance is dispatched complete with comprehensive installation, maintenance and user instructions.

Please note that this leaflet only provides a guide to installation and the features and benefits of the product. For full details please refer to the installation and commissioning instructions. We recommend that you attend our training course to gain knowledge on the best methods for installing our Greensource air to water heat pumps prior to fitting this appliance.

How Greensource air to water heat pumps distribute heat





The Greensource air to water heat pump range at a glance

Outdoor unit

	6kW	7kW	9.5kW
Dimensions w x h* x d	818 x 1,223 x 643mm	818 x 1,223 x 643mm	818 x 1,223 x 643mm
Weight	140kg	144kg	152kg
Outer casing	Galvanised powder coated steel		
Emitted/supplied output at +7/35ºC**	5.5/1.5kW	7.2/2.2kW	8.4/2.5kW
CoP -7/35ºC**	2.0	2.3	2.3
CoP 2/35ºC**	3.2	2.8	3.0
CoP 7/35ºC**	3.7	3.3	3.4
Heat carrier flow nominal (l/s)	0.19	0.29	0.34
I.P. rating	x4	x4	x4

**Without feet, additionally depending on the adjustment min. 20mm – max. 30mm.*
***Output data according to EN 14511 European Standards.*
CoPs are calculated using EN 14511.

Indoor hot water distribution unit

Dimensions w x h x d	600 x 1,660 x 615mm
Weight without water	122kg
Weight with water	347kg
Output of electric electric heater	4.5kW
DHW volume	151 litres
CH volume	55 litres
Power consumption of circulation pump	0.2kW
Mains electrical voltage	1 x 230V N AC 50Hz
I.P. rating	x4

Features	Benefits
Scroll compressor	Flow temperatures up to 65ºC
Low noise output	Quiet operation
2 years parts and labour guarantee*	Peace of mind
No flue system	Ease of siting
No gas or oil required	Ease of siting
Automatic defrost, -20ºC outside operation	Melts snow and ice automatically
Fast and easy installation	Through offering a complete system with indoor and outdoor unit
65ºC water temperature – wide application range	More retrofit installations possible e.g. connection to radiators
Compact size	600mm² internal hot water distribution unit
Fully integrated controls	Easy operation
Integrated stainless steel cylinder	Space saving and corrosion resistant
Fully integrated circulation pumps	Quicker installation and no need to purchase additional components
Built-in expansion vessels	Quicker installation and no need to purchase additional components
Diverter valves	Quicker installation and no need to purchase additional components
Inlet control set†	No need to purchase additional component

*Terms and conditions apply †Supplied in unvented kit

Hot water distribution unit

Outdoor unit

The Greensource air to water heat pump series

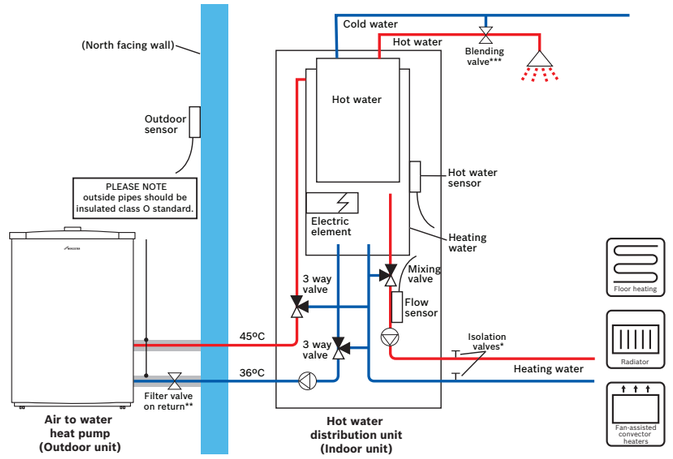
Worcester heat pumps make use of the latent energy from the outside air by converting it into heat which can be used with a typical wet heating and hot water system.

The heat pumps use the constant energy available in the air with a refrigerant circuit to allow the temperatures to be boosted to a useful level for the provision of heating or hot water for the home.

The system comprises an external energy collector and an internal Building Regulation G3 compliant heating and hot water distribution unit with a hot water store and heat delivery system, preferably to underfloor heating or alternatively to oversized radiators.

Worcester air to water heat pumps are intended to be the sole source of heating and hot water production for the home, giving the homeowner the option of removing the existing heat source from the property.

Principles of operation – how an air to water heat pump works



Note: *The heating system should be designed to maintain 70% of the nominal flow of the system across the heat pump at all times.*

Underfloor heating systems should have at least half of the coils fully open at all times.

Alternatively, or where TRVs are used, a by-pass may be fitted. This must still maintain 40% of the nominal flow across the heat pump.

Where it is not possible, due to the design of the heat emitters, to maintain this flow rate a Worcester primary store of around 100 litres should be fitted. See diagram on page 16.

**Recommended isolation valve*
***Filter valve fitted on return*
****A blending valve is supplied as standard and should be fitted prior DHW outlet*

In the outdoor unit the refrigerant meets the outdoor air in the evaporator (heat exchanger). The air is drawn through the evaporator by a fan located on top of the heat pump. The refrigerant, which is in a liquid state absorbs free energy from the air and evaporates in this process. A sensor in the expansion valve ensures that the liquid refrigerant collects the correct amount of the “free energy” before the refrigerant (now in a gas state) is led into the compressor.

The compressor increases the pressure of the refrigerant. The temperature of the vapour reaches approximately 100°C. The warm gas is then led into the condenser.

The condenser is the heat pump’s heat emitting part. In the condenser, which is a fully brazed heat exchanger in stainless steel, the refrigerant (gas state) meets the water from the heating system (radiators and/or floor coils). When the warm gas is cooled by the circulating heating water, it changes into a liquid state (condenses). Energy is emitted in this process to the heating system or the hot water. After the condenser, the refrigerant, which is now in liquid form, continues through a drying filter.

The drying filter is used to collect any moisture in the system. After the filter, the refrigerant passes through a sight glass.

The sight glass is used to check the level in the system. There should be no bubbles in the sight glass during normal operations. However, there might be bubbles when the heat pump is started and stopped or during defrosting. After the sight glass, the refrigerant continues on to an expansion valve.

The refrigerant pressure is lowered in the expansion valve. This also causes the temperature to drop. When the refrigerant has left the valve and passes the evaporator it changes to vapour again. This completes the refrigerant circuit. The expansion valve is equipped with a sensor (bulb) just before the compressor. The sensor controls the amount of fluid entering the evaporator.

Worcester offers a choice of 3 air to water heat pumps (6kW, 7kW and 9.5kW) which are intended to provide all the heating and hot water requirements of the home.

Performance

Greensource air to water heat pumps feature a highly efficient and effective scroll-type compressor which allows around 65ºC flow temperature from the appliance. This higher output temperature allows Greensource heat pumps to be effectively combined with radiators which should be sized correctly. However, wherever possible, Worcester recommends an underfloor heating system as the most compatible heat emitter system. The scroll compressor allows Greensource heat pumps to offer excellent CoP ratings.

Coefficient of Performance

The performance and efficiency of an air source heat pump system is commonly measured by the Coefficient of Performance (CoP). The CoP is a simple calculation which works out how much energy the heat pump is able to extract from the energy source compared to the amount of electrical energy used by heat pump.

$$\text{CoP} = \frac{\text{Heat output of system (useful heat)}}{\text{Electrical input from compressor and circulating pumps}}$$

E.g.:

$$\text{CoP of 3.3} = \frac{\text{9kW heat pump}}{\text{2.7kW of electrical input}}$$

The CoP depends on the temperature that can be extracted from the outdoor unit and the temperature required by the heating system of the house. The best combination for a high CoP would be a higher source temperature (e.g. 10ºC) and a lower flow temperature for the heating (e.g. 35ºC). The return on the energy employed in this case is higher since the heat pump has to increase the temperature by only 25ºC. If the energy from the source is lower in temperature and the required flow temperature is higher the CoP will be reduced.

The equation shown results in 2.7kW of heat provided by the pump (which is provided by electrical consumption) and 6.3kW of energy extracted from the atmosphere.

The table below shows the relationship between flow temperature and CoP. The CoP stated is for use only as typical examples and will differ between installations.

Relationship between flow temperature and CoP		
Heat delivery method	**Typical CoP**	**Flow temperature**
Radiators	3	40 - 50ºC
Underfloor heating	4 - 5	30 - 40ºC

Operation of the heat pump and heating and hot water distribution unit

The control unit uses two different methods to control the heat pump.

Control with outdoor sensor

A sensor is installed outside on a north facing wall of the property. Control with an outdoor sensor means that the heat pump automatically regulates the heating in the house depending on the outdoor temperature. If the outdoor temperature drops, the underfloor heating/radiators inside the house will become warmer.

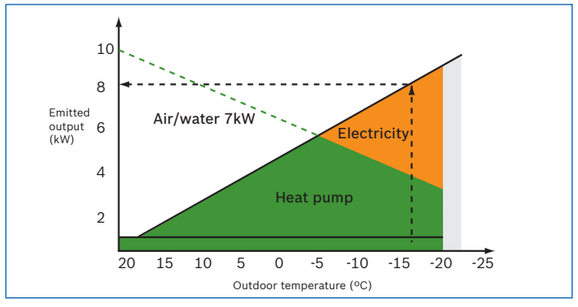
The user determines the response from the heat pump in relation to the outdoor temperature, with the help of a number of settings such as selecting the heat curve on the control unit.

Control with outdoor sensor supplemented with room sensor

Control with an outdoor sensor supplemented with a room sensor means that a sensor can be placed in a reference position inside the house. This is connected to the heat pump and provides the control unit with information about the room temperature. The signals affect the control unit's settings (heat curves) and ensure the heat pump gives the best possible energy savings.

The heat curve slope can be changed to increase or decrease the heating in the house.

Emitted output air/water

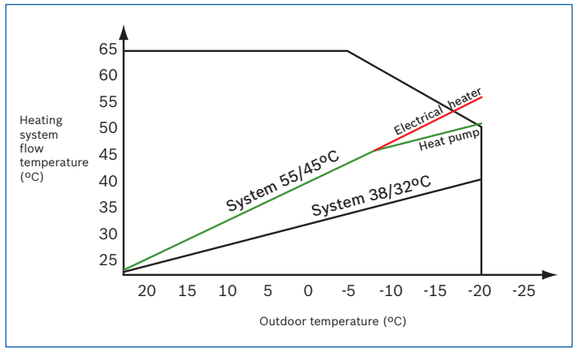


Curve slope settings:

The unit is already factory preset, however you can adjust the heat curve to a level for the heating system to suit your property type.

Weather compensation control method

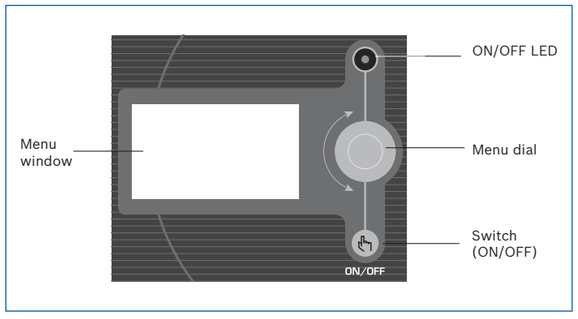
If the outdoor temperature drops, the flow temperature increases. If the outdoor temperature increases, the flow temperature drops.

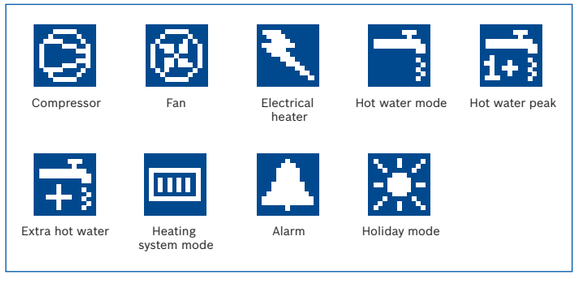


Heat curve

Controls

Greensource air to water heat pumps are controlled by a Rego 800 control unit. The unit ensures that the heat pump works efficiently when required and dictates that the hot water heating is given priority over space heating. The control unit has a simple main "Menu" and "Advanced Menu".





Greensource air to water heat pump control panel

Working temperatures

Maximum working temperatures

The heat pump can work with a maximum return temperature of approximately 59ºC. If the temperature rises above this value the heat pump will automatically stop.

Minimum working temperatures

The heat pump is designed to stop if the outdoor temperature falls below -20ºC. Supporting additional heat could be produced by the additional elective heater from temperatures below -3ºC. The heat pump re-starts automatically when the outdoor temperature climbs above -20ºC.

Defrosting the heat pump

The principle of defrosting in the heat pump is known as hot gas defrosting. During defrosting, the flow in the refrigerant circuit is reversed by means of an electrically-controlled four-way valve. The compressed gas from the compressor is fed into the top of the evaporator, causing the ice on the outside to melt. During this process, the heating water is cooled slightly. Hot gas is sprayed into the evaporator and a sensor ensures that the process functions correctly. The time required for defrosting depends on the amount of ice and the outdoor temperature. This also acts as a fan defrost function, which blows hot air upwards through the fan to prevent it freezing solid.

Greensource air to water components list

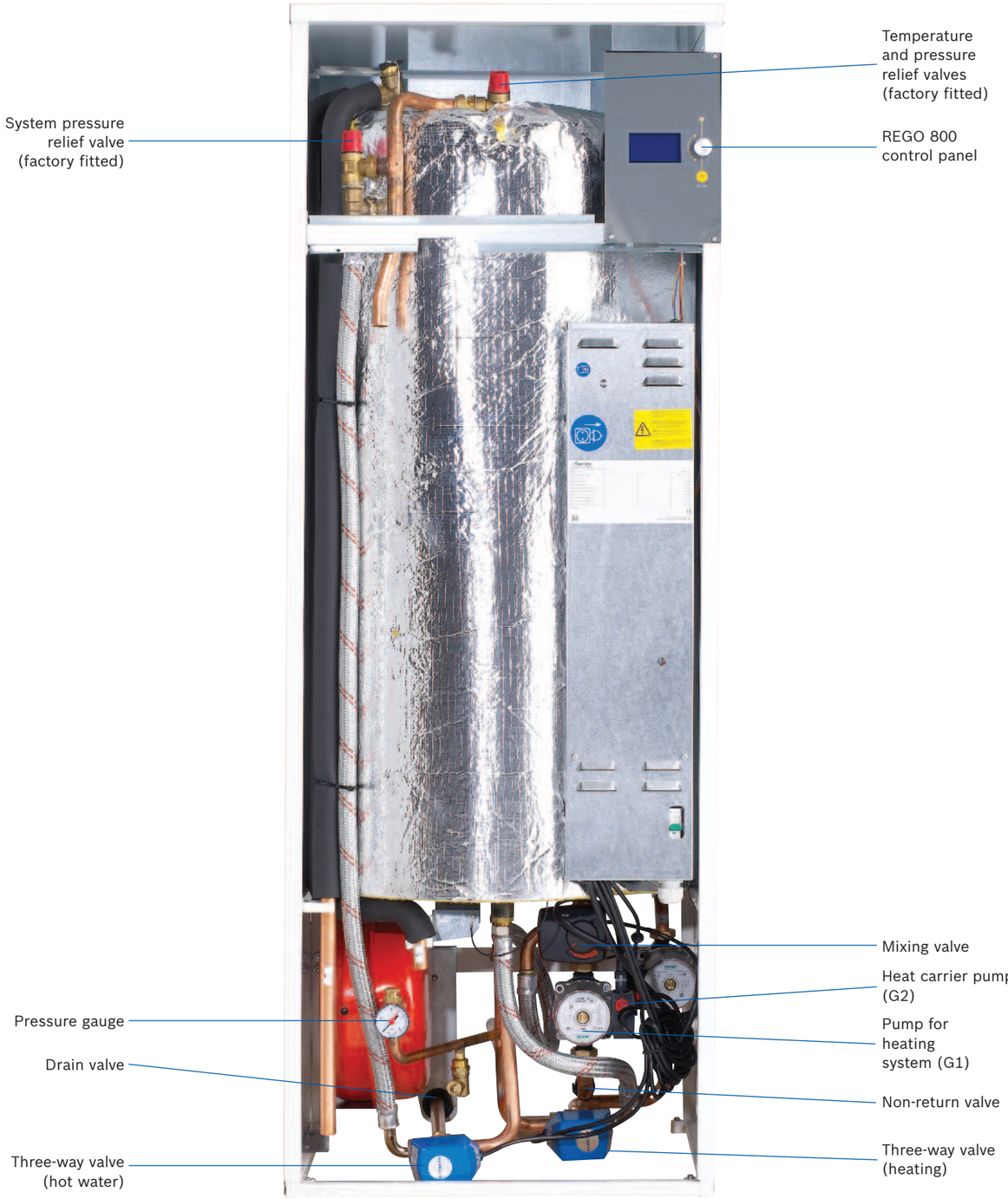
1 x tundish factory fitted 22mm x 1"
1 x tundish 15mm x 22mm
4 x rubber feet
1 x circlip pliers
2 x flexible connection hoses
1 x particle filter valve
2 x indoor/outdoor sensors with cable
1 x unvented kit
1 x hot water blending valve
1 x 32mm (1 1/4") universal waste fitting
1 x heating system filling loop
1 x user guide (heat pump)
1 x user guide (heating and hot water distribution unit)
1 x installation manual and guarantee card

Electrical isolation

Note: Both the indoor and outdoor units require a means of electrical isolation. It is recommended that the outdoor and indoor units are supplied by an aM type fuse or a C and D characteristic McB.

Inside story – Greensource heat pump outdoor unit

Inside story – Greensource heating and hot water distribution unit



Note: An unvented kit, which includes a filling loop, blending valve, a 19 litre expansion vessel and hose, inlet control set, 15mm x 22mm tundish and waste coupler is supplied with each unit.

Technical data – Greensource air to water heat pump outdoor unit

Model	Greensource air to water heat pump 6kW	Greensource air to water heat pump 7kW	Greensource air to water heat pump 9.5kW
Dimensions w x h x d (mm)*	818 x 1,223 x 643	818 x 1,223 x 643	818 x 1,223 x 643
Weight (kg)	140	144	152
Outer casing	Galvanised powder coated steel	Galvanised powder coated steel	Galvanised powder coated steel
Emitted/supplied output at +7/35ºC	5.5/1.5	7.2/2.2	8.4/2.5
Heat output / CoP -7/35ºC[1]	2.8/2.0	5.0/2.3	5.6/2.3
Heat output / CoP 2/35ºC[1]	4.6/3.2	6.1/2.8	7.1/3.0
Heat output / CoP 7/35ºC[1]	5.5/3.7	7.2/3.3	8.4/3.4
Heating system flow nominal (l/s)	0.19	0.29	0.34
Internal pressure drop heat carrier (kPa)	5	6	7
Air flow (m^3/h)	2,200	2,200	2,200
Electrical consumption fan (A)	0.44	0.44	0.44
Fuse size – Amperes time delay[4]	16	25	25
Starting current – softstart (A)	23.43	30.56	32.05
Electrical supply	230V 1N ~ 50Hz	230V 1N ~ 50Hz	230V 1N ~ 50Hz
Compressor	Scroll	Scroll	Scroll
Compressor oil	FV 50S	FV 50S	FV 50S
Maximum outgoing flow temperature (ºC)	65	65	65
Refrigerant filling R-407C (kg)	2.5	2.6	2.95
Defrost system	Hot gas with four-way valve	Hot gas with four-way valve	Hot gas with four-way valve
Operating temperature[5] (ºC)	-20 to +35	-20 to +35	-20 to +35
HTF connection, clamping ring (mm)	Hose 1" internal thread	Hose 1" internal thread	Hose 1" internal thread
Sound power level[2] (dB(A))	65	65	65
Sound pressure level[3] (dB(A))	53	53	53
I.P. rating	x4	x4	x4

** Without feet, additionally depending on the adjustment min. 20mm – max. 30mm.*
[1] Output data at +7/35ºC, +7/45ºC are stated according to the European Standard EN 14511.
[2] Calculated value at 1m distance according to EN ISO 3743-2.
[3] Calculated value at 1m distance according to EN ISO 11203.
[4] aM type fuse, C characteristic McB.
[5] Tested at -17ºC according to the European standard EN 14511-4.
CoPs are calculated using EN 14511.

Technical data – Greensource indoor hot water distribution unit

Model	Greensource heating and hot water distribution unit
Dimensions w x h x d (mm)*	600 x 1,660 x 615
Weight without water (kg)	122
Weight with water (kg)	347
Output of electric heater (kW)	4.5
Power consumption of circulation pump (kW)	0.2
Mains electrical voltage	230V IN - 50Hz AC
Fuse rating (Amps)**	25
Maximal power consumption (kW)	4.7
Maximum working pressure	2.5bar (0.25MPa)
Volume DHW cylinder/Primary water (litres)	151/55
Expansion vessel size (litres)	12
Pump for the heating system G1	Wilo Star RS 25/6-3
Heating fluid pump G2	Wilo Star RS 25/6-3

** Without feet, additionally depending on the adjustment min. 20mm – max. 30mm.*
*** aM type fuse D characteristic type McB means of electrical isolation required.*

Heat pump data

Heat pump system

Model	Greensource air to water heat pump 6kW	Greensource air to water heat pump 7kW	Greensource air to water heat pump 9.5kW
Rating or aggregate rating (Amps)	50	63	63
Standard compliance	BS EN 61000-3-11	BS EN 61000-3-11	BS EN 61000-3-11
Complies with technical requirements	–	–	BS EN 61000-3-3
Harmonics standard compliance	BS EN 61000-3-12	BS EN 61000-3-12	BS EN 61000-3-12
Stages	3 x 3kW	3 x 3kW	3 x 3kW
Time delay between stages	20 min ramp up 0 - 100%	20 min ramp up 0 - 100%	20 min ramp up 0 - 100%

Heat pump compressor

Model	Greensource air to water heat pump 6kW	Greensource air to water heat pump 7kW	Greensource air to water heat pump 9.5kW
Rating or aggregate rating (kW)	1.94	1.94	2.99
Maximum starting current (Amps)	22.9	23.8	30.9
Minimum time between starts (minutes)	30	30	30
Compressor method of starting	Electronic soft start	Electronic soft start	Electronic soft start
Starting power factor	0.30	0.30	0.30

Additional heating elements

Model	Greensource air to water heat pump 6kW	Greensource air to water heat pump 7kW	Greensource air to water heat pump 9.5kW
Aggregate rating (kW)	4.5	4.5	4.5
Stages	1.5kW x 3	1.5kW x 3	1.5kW x 3
Time delay between stages	20 min ramp up 0 - 100%	20 min ramp up 0 - 100%	20 min ramp up 0 - 100%

Installing the Greensource air to water heat pump

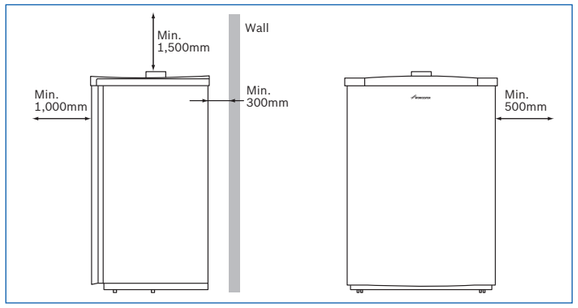
Siting of the outdoor unit

The heat pump is located outdoors and contains a number of sensitive parts. It is important that it is stood on a flat, solid base, e.g. concrete slabs*. The heat pump should be positioned at least 300mm from the building into which it connects with the internal heating and hot water distribution unit. The internal heating and hot water distribution unit should be located as close as possible to the heat pump and the outdoor connecting pipes should be suitably insulated with Class O insulation to prevent freezing and the fluid dosed with inhibitor and antifreeze.

The heat pump will produce between 15 - 25 litres of condensation per day, depending on external temperatures, and this should be diverted to a mains drain or a soak away. **In order to prevent freezing the condensate pipe must be insulated and the drainage pipe must slope towards a drain.**

The outdoor heat pump can be sited up to 15 metres from the property using 19mm thick Class O pre-insulated plastic pipe available from:
Watts Industries UK Ltd,
Grosvenor Business Park,
Evesham,
Worcestershire WR11 1GA
Tel: 01386 446997

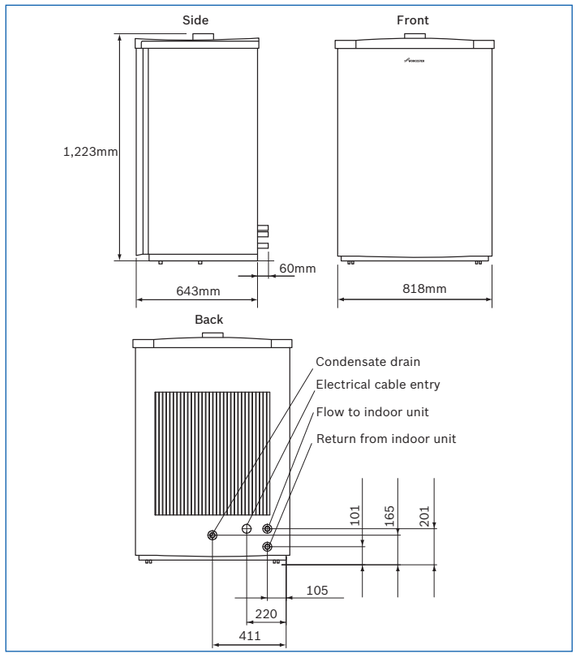
Installation clearances



Outdoor unit clearances	
Minimum distance from pump to wall (mm)	300
Minimum distance in front of pump (mm)	1,000
Minimum distance to the side (mm)	500
Minimum distance above (mm)	1,500

The outdoor unit must be installed at least 2,000mm below a roof to avoid the recirculation of cold air.

Outdoor unit casing dimensions and pipework connections



The flow is connected to the inlet marked ‘forward flow’.

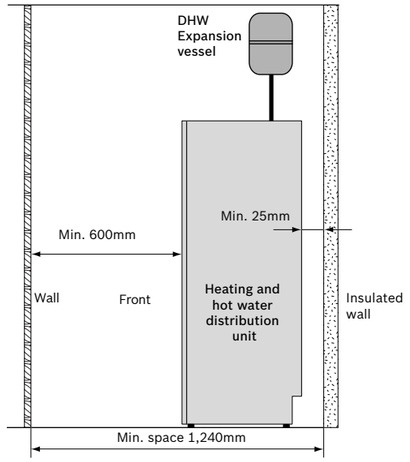
The following connections are made to the heat pump:
A 32mm plastic pipe is taken from the drainage pipe to the drain.

**Rubber matting can be used directly under the heat pump as a sound proofing method if required.*

Siting of the heating and hot water distribution unit

Installation clearances

A minimum of 600mm is required in front of the unit. The other sides can be blocked. A minimum of 25mm is required between the unit and other permanent installations e.g. walls, sinks, etc.



Heating and hot water distribution unit pipework connections

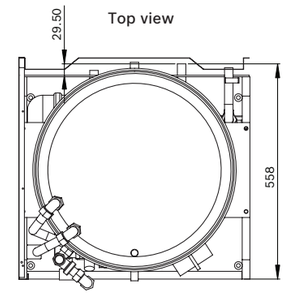
The return is connected to the inlet marked ‘return flow’. Cold water and hot water are connected to inlets marked ‘cold water’ and ‘hot water’.

Pipework dimensions

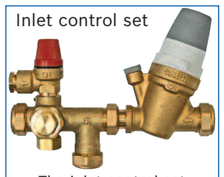
Heating and hot water distribution unit pipework dimensions	
Heating flow and return	
Connection size	22mm dia.
Hot and cold water	
Connection size	22mm dia.
To/from connections	
Connection size	22mm dia. (in HWDU)
To indoor unit	
Connection size	28mm dia. (in heat pump)
From heat pump	
Waste water/drainage	32mm dia. (in both)

All connections must be made using the sizes listed above.

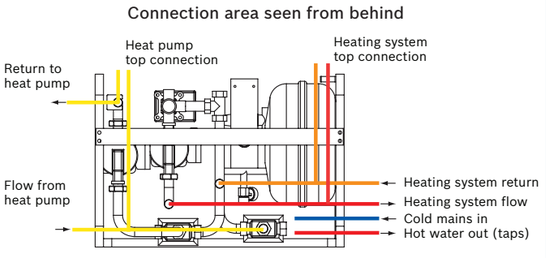
Hot water distribution connection layout



Front view



The inlet control set supplied should be mounted externally in line with G3 regulations.



The unit can be connected either from the top or from the rear connections.

The purpose of the particle filter valve is to filter out dirt before it can enter the heat pump. Accordingly, the supplied particle filter valve should **always** be fitted on the return pipe between the indoor and outdoor unit. It should be fitted as close to the heat pump as possible and be horizontal.

Floor preparation

The appliance is designed to be free standing and should be located on a flat surface which is able to support the weight of the product, accessories and fluid content. The appliance has rubber feet which can be adjusted to suit the installation.

Installation requirements

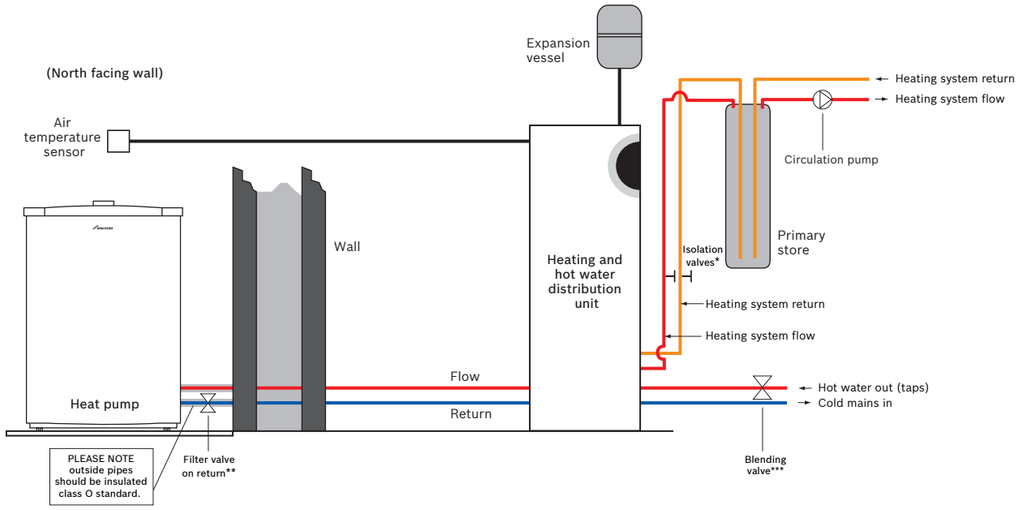
System design requirements

The heating system should be designed to maintain 70% of the nominal flow of the system across the heat pump at all times.

Underfloor heating systems should have at least half of the coils fully open at all times.

Alternatively, or where TRVs are used a by-pass may be fitted. This must still maintain 40% of the nominal flow across the heat pump.

Where it is not possible, due to the design of the heat emitters, to maintain this flow rate a Worcester primary store of around 100 litres should be fitted.



**Recommended isolation valve **Filter valve fitted on return ***Blending valve fitted to DHW pipe*

System layout

Connecting the heat pump to the heating system

Care should be taken to avoid excessive use of flux on copper pipe connections to minimise the amount of debris and blocking of the filter.

System flushing and care

Central heating systems must be flushed before the heat pump is installed. The system should be prepared in accordance with the guidelines of BS 7593 : 2006.

The filter on the primary circuit should be checked during the first week of operation to ensure that any debris is removed.

It is important that all previously mentioned preparations have been carried out before the heat pump is connected to the heating system. Also ensure the pipe system has been well flushed before it is connected to the heat pump. Flushing protects the heat pump from contamination.

The heat pump is a part of the heating system. Faults in the heat pump can be caused by poor water quality in the radiators or underfloor coils or because air is penetrating the system continuously. Oxygen causes corrosion products in the form of magnetite and sediment. This is detrimental to the heat pump components and reduces their working life. Existing heating systems which require regular filling or where the heating water is not clear when drained, require cleaning and flushing before the installation of a heat pump, for example the heating system must be fitted with filters and vents.

Heat pump sizing

Although the sizing of the heat pump can only be accurately carried out by taking all factors into consideration, this section offers some explanation of the principles behind the sizing of heat pump according to the energy requirement of the property.

The following examples are for demonstration purposes only:

An air source heat pump is typically sized to provide around 85% of the peak load of the house on the coldest day. Since the number of days in a year that this requirement occurs is relatively low, the heat pump is typically sized to provide 95% of the total heating requirement for a property over the year. The remaining energy is provided by the built-in electrical heater.

The benefit of sizing the heat pumps below the peak load requirement is that the pump, for the majority of the year, is able to remain on and deliver a ‘trickle charge’ of heat to the property, rather than being oversized and constantly cycling in and out of operation. This helps the heat pump to offer better efficiency.

There are significant climatic differences across the UK and this should be taken into consideration when sizing the heat pump. The Worcester system design service is able to provide information on an individual basis.

For more information on the suitability of heat pumps for your home visit **www.worcester-bosch.co.uk.**

Communication cable

In the control unit the different circuit boards are connected by a data communications cable (CANbus). This cable is **NOT SUPPLIED** by Worcester, Bosch Group. A cable similar to CAT 5 E FTP 2 x 2 x 0.5 screened CANbus can be used.

CANbus cable must be a twisted pair, screened and earthed. Maximum cable length is 20 metres. CANbus cables **MUST NOT** be laid alongside power cables.

Warning: These connections must not be mixed up. If 12 volts are supplied on either CANL or CANH the processors may result in damage. The four cables should be attached on contacts with corresponding marking on the Greensource air to water heat pump and the heating and hot water distribution unit.

Dip switch S1

All CANbus pcbs should be connected in series and the dip switch marks the beginning and the end of a CANbus net. Therefore, the dip switch on the HWDU display and on the heat pump must be in the ‘TERM’ position. All others must be in the opposite position (not terminated).

Refrigerants

The Worcester Greensource air to water heat pump system uses R407c pre-charged refrigerant.

Maintenance on the outdoor heat pump

The outdoor heat pump unit should be checked regularly for leaves and debris, especially on the evaporation fins and water tray. These must only be cleaned using a watering can with a rose and a soft cloth to prevent damage.

Maintenance on the indoor unit

This should be serviced annually in accordance with G3 requirements.

Spare parts

Only genuine Worcester, Bosch Group spare parts can be used with these products.

Standards

The installation of the Worcester Greensource air to water heat pump system must be carried out in accordance with the relevant requirements for safety, current Wiring Regulations, local Building Regulations, Building Standards (Scotland), (Consolidation) Regulations and Bylaws of the local water company and Health and Safety document No. 63S (Electricity at Work Regulations 1989). It should be in accordance with the relevant recommendations of the following British Standards and Regulations:

CoPs are calculated using EN 14511 which includes the compressor and all pumps.

BS EN 378
Refrigerating systems and heat pumps. Safety and environmental requirements.

The Health and Safety at Work Act 1974

The Management of Health and Safety at Work Regulations 1999

The Construction (Health, Safety and Welfare) Regulations 1996

The Construction (Design and Management) Regulations 1994

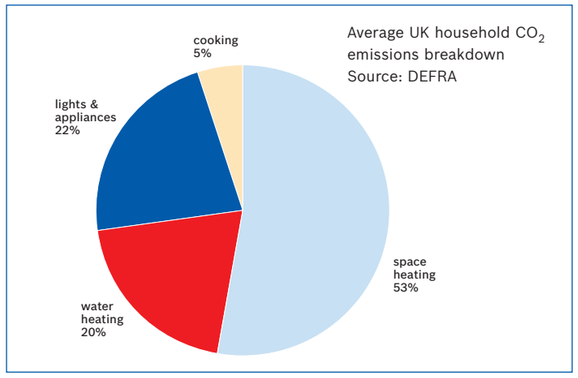
The Lifting Operations and Lifting Equipment Regulations 1998, and any other relevant regulations in force at this time.

The manufacturer’s notes must not be taken in any way as overriding statutory regulations.

The Code for Sustainable Homes

Why we need a Code for Sustainable Homes

Carbon emissions from domestic properties have to be reduced – a fact highlighted by statistics for 2004 which show that 73% of domestic CO_2 emissions are produced by the provision of heating and hot water.



Worcester Greensource air to water heat pumps comply with the requirements for the Government's Code for Sustainable Homes, a major initiative which is designed to reduce domestic CO_2 emissions.

The purpose of the Code is

- to act as new single national standard for key elements of design and construction of sustainable homes
- an opportunity to build future housing stock that meets Britain's needs and protects the environment
- to act as a means of ensuring continuous improvement, greater innovation and exemplary achievement in sustainable home building
- to provide a standard which builds on the successful EcoHomes System devised by the BRE (Building Research Establishment).

The benefits of the Code

For the environment the benefits include:

- reduced carbon dioxide emissions (a major cause of climate change)
- better adaptation to climate change through measures such as improved water efficiency and management, household recycling and the use of less-polluting materials.

For new home builders the benefits include:

- satisfying the growing demand for new homes which are both more sustainable and more economical to run
- demonstrating the degree of this sustainability through the star rating
- establishing a competitive edge over lower-rated new homes
- finding innovative solutions to exceeding the Code's minimum requirements.

For social housing providers the benefits include:

- lower running costs (through greater energy and water efficiency)
- enhanced comfort and increased tenant satisfaction
- continuing to meet or exceed the standards for funding.

For tenants and homeowners the benefits include:

- reducing their own environmental footprint
- enjoying lower running costs through greater energy and water efficiency than homes not built to Code standards
- benefits such as more natural light and other features and standards which enhance feelings of well-being which result in a more pleasant, healthier, living environment.

How the Code works

The Code measures a home's sustainability against these 9 design categories, rating the 'whole home' as a complete package:

- energy and CO_2
- materials
- waste
- health and well-being
- ecology
- water
- surface water run-off
- pollution
- management

- The Code's rating system uses stars to indicate a home's overall sustainability performance across the 9 design categories
- A home can achieve a rating of from 1 to 6 stars – 1 being the lowest (entry level) rating but above the level of the building regulations, and 6 reflecting exemplary standards in sustainability terms
- There are minimum standards for some categories, and these must be achieved to gain a 1-star sustainability rating
- Energy efficiency and water efficiency, vital to the sustainability of any home, also have minimum standards that must be achieved at every Code level
- Apart from these minimum requirements the Code is completely flexible, allowing developers to choose which and how many standards they implement to achieve a higher sustainability rating
- The table below shows the 9 design categories and the degree of flexibility offered by each:

Flexibility of the Code

Categories	Flexibility
Energy/CO_2 Water	Minimum standards at each level of the Code
Materials Surface water run-off Waste	Minimum standards at Code entry level
Pollution Health and well-being Management Ecology	No minimum standards

- To achieve a particular Code level and the associated sustainability rating, a home must integrate minimum standards and attain additional points for other design features. The table below shows the minimum standards and credits awarded to achieve each Code level.

Achieving a sustainable rating (minimum standards)

	Energy		Water		
Code Level	Improvement over 2010 TER	Credits awarded for Ene 1	Maximum standards in indoor water consumption (Ltrs per person per day)	Credits awarded	Other credits required
1(★)	Part L 2010 compliant	0	120	1.5	33.3
2(★★)	Part L 2010 compliant	0	120	1.5	43.0
3(★★★)	Part L 2010 compliant	0	105	4.5	46.7
4(★★★★)	25%	3	105	4.5	54.1
5(★★★★★)	100%[1]	9	80	7.5	60.1
6(★★★★★★)	Net zero CO_2 emissions[2]	10	80	7.5	64.9

1. Zero emissions in relation to Building Regulations issues (i.e. zero emissions from heating, hot water, ventilation and lighting).
2. A completely zero carbon home (i.e. zero net emissions of carbon dioxide (CO_2) from all energy use in the home).
All points are rounded to one decimal place.

Frequently asked questions

What benefits do air to water heat pumps offer over ground source heat pumps?
There are significant benefits – lower installation costs – no need to dig trenches or boreholes. The Greensource air to water heat pump is a self contained unit that simply needs connecting to the mains electricity supply and the building's wet heating system. They also take up much less space too as you don't need a large area for the collector trenches required for ground source heat pumps.

What refrigerant is used in Greensource air to water heat pumps?
Greensource air to water heat pumps use R407C. It is an approved refrigerant featuring zero Ozone Depleting Potential. It also has a low Global Warming Potential which is more environmentally friendly.

What is the lower limit operating temperature?
The lower limit operating temperature of Greensource air to water heat pumps is -20°C.

What are the key maintenance requirements for Greensource air to water heat pumps?
It will need servicing once a year by a qualified maintenance technician. The technician will need to check a number of things during the service, including:

- A temperature pressure relief valve is fitted – in line with G3 requirements for unvented cylinders
- Check the unit for signs of damage or corrosion
- Check the panels to ensure there is no vibration and that they are properly fastened
- All water connections must be checked for tightness or signs of leakage and the system water pressure must be checked
- The air path to and from the unit must be checked to ensure it is clear
- The heat pump water drain tray and the pipe to it must be checked to ensure it is clear and clean.

The technician should then turn the unit on and check that:

- the controls are operating properly
- the water pump is free and operating properly
- the unit's fan is operating
- that the unit is increasing the water to the correct operating temperature.

How should the unit be sited to ensure the airflow and access it needs?
What's important is to ensure there is sufficient space for airflow into the unit and enough clearance at the front of the heat pump to stop cold air re-circulation. You'll also need to ensure that there is adequate space for access for service and maintenance. You should try to ensure that the unit is sheltered from high winds as this will improve the unit's efficiency level by lowering the fan power requirement. The minimum clearances required are shown on pages 14 and 15.

What size of cable should be used to connect the air to water heat pump to the mains electricity supply?
Consideration should be given to the size of the unit, the length of the cable run and the type of cable being used. Only have installation work carried out by qualified technicians who will be able to calculate the correct cable size for each installation.

What is the most efficient flow water temperature setting?
The lower the flow water temperature the less hard the heat pump has to work and the more efficient it will be. It depends on the type of heating system the heat pump is working alongside, but we recommend that the operating temperature for an underfloor heating system is 35°C and for a typical radiator system is 50°C.

What size of radiators should be used on installations linked to air to water heat pumps?
We recommend that radiators are appropriately sized based on the heat loss of the home. Most radiator manufacturers will supply selection tables and offer advice on this.

Can you combine radiators and underfloor heating when using an air to water heat pump?
Yes you can. However, the heat pump return water temperature should be set for a radiator system at the higher return temperature and a mixing valve should be fitted to reduce the water temperature for the underfloor heating part of the system.

What is the recovery time for the hot water cylinder?
Full volume from 15°C to 55°C = 2 hrs 15mins.
70% of volume from 15°C to 55°C = 1hr 50mins.

Can the external air to water heat pump unit be hidden behind bushes, trees and fences?
Yes, but you have to be aware that wherever you position the unit it has to have adequate airflow available to it and that the discharge air can't be re-circulated back to the inlet. If you don't take enough care in this respect, it will result in lowering the air temperature and can significantly reduce the efficiency of the unit. Our recommended clearances should be noted on page 14.

Can an air to water heat pump be used to cool the home as well as providing heat?
Our Greensource air to water heat pumps are designed to produce heating and hot water only. Greensource air to air heat pumps can cool the home as well as heating it.

What warranty is available?
Greensource air to water heat pumps come with a 2 year manufacturer's guarantee provided that the guarantee is registered within 30 days of installation. For more information please call 0845 725 6206.

Is there a training course available?
Yes, Worcester offers a range of training courses including a 1 day Greensource Air to Water training course. Please call 01905 752526 for more information.

Renewable Heat Incentive (RHI)

Is there any Government funding to help with the cost of installing an air to water heat pump?
The UK Government's Renewable Heat Incentive Premium Payment scheme (RHIPP) is designed to encourage people to install renewable technologies.

From 1st August 2011 to 31st March 2012, £15 million will be available on a first come, first serve basis. The funding will mainly be for the 4 million UK households that do not have mains gas.

The amount received as part of the Renewable Heat Premium Payment scheme, depends on which technology the homeowners is applying for. The voucher value for an air source heat pump is £850.

Homeowners need to ensure that they have basic energy efficiency measures and it will be on a first come first served basis.

Who can apply for the Renewable Heat Premium Payment?
If the resident lives in England, Scotland or Wales, they are eligible to apply for the Renewable Heat Premium Payment.

If the homeowners currently relies on oil, liquid gas, solid fuel or electricity then they can apply for air to water source heat pumps.

So only those who do not currently use gas as their main heating fuel can apply for this renewable technology.

To find out more visit our website:
www.worcester-bosch.co.uk/installer/products/funding-for-renewable-technologies

Greensource air to water heat pump range and accessories

Greensource 6kW Outdoor Heat Pump and Hot Water Distribution Unit*

Worcester Part No.
7 716 150 008

Greensource 7kW Outdoor Heat Pump and Hot Water Distribution Unit*

Worcester Part No.
7 716 150 009

Greensource 9.5kW Outdoor Heat Pump and Hot Water Distribution Unit*

Worcester Part No.
7 716 150 010

100 litre Buffer Storage Tank

Worcester Part No.
7 716 192 418

120 litre Buffer Storage Tank

Worcester Part No.
7 716 192 638

*Comes complete with 19 litre unvented kit.

The very best training programmes from Worcester

Worcester has always placed great emphasis on technical support and training for installers and service engineers. Advances in heating technology, including the increasing use of renewables, make the need for training greater than ever.

To ensure the highest levels of competence and expertise in the installation of all Worcester products, the company runs intensive training courses for installers, commissioning engineers and operatives involved with servicing and fault finding.

Courses available

Our training facilities offer a number of courses suitable for the installer and commissioning engineers, and more in-depth courses for the servicing and fault finding engineers.

Training centres throughout the UK

To enable us to meet the growing demand for training we have invested in additional facilities at the award-winning training academy at our Worcester headquarters. In addition to the original academy there is now a new 400m^2 unit, 25% of which is devoted to an open-plan domestic training area with life-size single-storey brick buildings. These feature working Greenskies solar thermal systems which enable installers to get up onto the roof of the building to get more realistic training. There are bays full of all Greenstar gas-fired appliances, so installers can really get to grips with the importance of system design. The additional space will also contain dedicated training areas for our renewable and future products. The training centre will also run certified CODNC01 and COCN1 courses. CODNC01 equips installers with the relevant qualifications for the changeover from domestic to commercial gas work. COCN1 allows existing commercial installers to renew their qualification.

Further academies are located at West Thurrock in Essex, Bradford and Clay Cross in Derbyshire, all offering our full suite of courses. Please phone 01905 752526 for more information about a course near you. Each course is run by specialist trainers and is superbly equipped to deliver a combination of classroom theory and practical hands-on experience that's second to none.

College-linked Learning

As well as offering training at our own centres, Worcester has established close partnerships with many colleges around the UK, equipping them with our latest products. Call us on 01905 752526 to find out when we will be running the course of your choice at a college in your area.

Mobile training

To complement our training venues across the country, we can also bring training to you.

We have mobile vehicles fully equipped with operational Greenstar gas-fired boilers, dry strip-down models and even a Greensource air to air heat pump, ensuring that quality training in a comfortable environment can be achieved on your doorstep!

If it's oil training you require, our 7.5 tonne mobile oil vehicle is available throughout the country for hands-on product training and OFTEC assessments.

Distance learning/web based learning

Worcester has produced a selection of Distance Learning CD ROMs/DVDs which are packed with information. Call 0844 892 9800 for your copies, or visit **www.worcester-bosch.co.uk** for information on Web Based Learning.

Get on course for a more profitable future now.

Call now for more information 01905 752526

Worcester training courses

One stop shop training

We are here to provide you with training and assistance for all areas of your business, not just product training.
Call us on 01905 752526 to order a full training course brochure.

Boiler training courses		
Greenstar CDi gas-fired condensing combi boilers		
Models covered	Greenstar 27/30/37/42CDi	Duration: 1 day
Greenstar i Junior & Si gas-fired condensing combi boilers		
Models covered	Greenstar 24/28i Junior and Greenstar 25/30Si	Duration: 1 day
Greenstar Highflow CDi & FS CDi regular floor standing gas-fired condensing combi and regular boilers		
Models covered	Greenstar Highflow 440/550CDi and Greenstar FS 30/42CDi Regular	Duration: 1 day
Greenstar system & regular gas-fired condensing boilers		
Models covered	Greenstar 12/15/18/24Ri, Greenstar 30/40CDi Regular, Greenstar FS 30/42CDi Regular, Greenstar 30CDi System and Greenstar 12/15/18/24i System	Duration: 1 day
Greenstar Danesmoor, Heatslave & Camray high efficiency condensing oil-fired boilers – pre-OFTEC training		
Models covered	Greenstar Danesmoor series, Greenstar Heatslave series and Greenstar Camray series	Duration: 1 day
Greenstar controls		
Models covered	MT10, MT10RF, DT20RF, DT20, DT10RF, TD200, RT10, FR10, FR110, FW100 and ISM1	Duration: 1 day

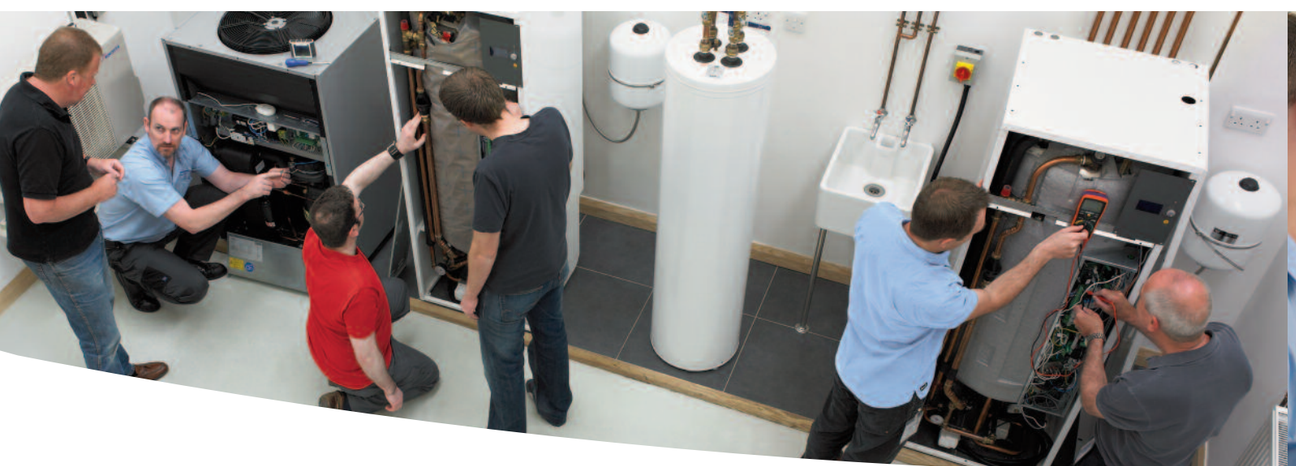
Renewable training courses		
Greenskies solar hot water system		
Covering	Installation, commissioning and servicing	Duration: 2 days
Greenskies advanced solar		
Covering	Worcester solar control range and pump stations	Duration: 1 days
Greenstore ground source heat pumps		
Covering	Installation, commissioning and system design	Duration: 2 days
Greensource heat pumps – air to water		
Covering	Installation, commissioning and system design	Duration: 2 days
Greensource heat pumps – air to air		
Covering	Installation, commissioning and system design	Duration: 1 day
Greenfloor heating		
Covering	Installation, commissioning and servicing	Duration: 1 day
Greenstream MVHR		
Covering	Installation, commissioning and system design	Duration: 1 day

Industry focused training courses		
BPEC warm water underfloor heating installation		
Covering	Basic principles & advantages of underfloor heating, floor systems and finishes, operation, installation, testing and post installation activities	Duration: 2 days
BPEC ventilation		
Covering	Installation, commissioning, inspection and testing	Duration: 2 days
Hot water systems & safety		
Covering	All G3 Regulations for the installation, servicing and commissioning of unvented cylinders. This course is certified by Logic Certification.	Duration: 1 day
Chemical water treatment		
Covering	Water treatment of domestic heating systems in accordance with BS 7593: 2006	Duration: 1 day
Construction skills F-Gas training/assessment certification		
Covering	Qualifies for Construction Skills Certification & Registration (valid for 5 years) and Voluntary ACRIB Registration	Duration: 4 days

Domestic ACS training and assessment		
Initial CCN1 + 4 appliances + CPA1		
Covering	Designed for candidates whose qualifications expired more than 12 months ago	Duration: 5 day
Reassessment CCN1 + 4 appliances + CPA1		
Covering	Re-assessment for candidates whose CCN1 qualification expires in less than 12 months	Duration: 4 days

OFTEC training and assessment		
OFTEC 101		
Covering	Domestic/light commercial pressure jet commissioning and servicing	Duration: 3 days
OFTEC 105e		
Covering	Domestic/light commercial pressure jet boiler installation	Duration: 1 day assessment
OFTEC 101 & 105e		
Covering	Domestic/light commercial pressure jet installation, commissioning and servicing	Duration: 3 days
OFTEC 600a		
Covering	Oil tank installation and associated controls	Duration: 1 day assessment
OFTEC 101/105e/600e		
Covering	Domestic/light commercial pressure jet boiler installation, commissioning, servicing and oil tank installation and associated controls	Duration: 4 days
Mobile OFTEC		
All above covered throughout the country on the mobile training vehicle as well as in all our centres		

Please note to attend OFTEC courses you must have a minimum of 12 months' experience installing/servicing oil boilers. For inexperienced candidates, our Greenstar Danesmoor, Heatslave and Camray course offers pre-OFTEC training. For experienced oil technicians training is not a pre-requisite for OFTEC assessment.



A complete after-sales service

As part of the worldwide Bosch Group, Worcester strives to maintain the highest possible standards of after-sales care.

In addition to the no-nonsense parts and labour guarantee applicable to all Worcester products, you and your customers have the assurance that every Worcester product is manufactured to both the appropriate British and European standards.

Worcester Contact Centre

Should you require support, our fully trained Contact Centre staff, based at our head office in Worcester, are ready to take your calls. Whatever your query our contact centre operators along with our nationwide team of engineers are ready to help you.

If you do not offer annual service and maintenance contracts please refer your customers to the Worcester Contact Centre:
Tel: 0844 892 3000
Fax: 01905 757 536

Opening Times

Monday – Friday: 7.00am – 8.00pm
Saturday: 8.00am – 5.00pm
Sunday: 9.00am – 12 noon

All the technical advice you need

Spares

Genuine replacement parts for all supported Worcester products are readily available from stock, on a next day delivery basis. For more information please call your local stockist. You can find a spares stockist on our website.

Customer Technical Support

The Worcester Technical Helpline is a dedicated phone line – committed to providing a comprehensive service to complement the brand name and quality of our products. Our experienced team of technical experts provides answers to queries of a technical nature across the entire Worcester range.

Worcester also has a pre-sales department, which provides assistance in selecting a heating system to suit a particular application, along with full guidance on installation. For more information please contact the Technical Helpline or alternatively visit our website where literature can be downloaded at **www.worcester-bosch.co.uk.**

Worcester System Design Service

Worcester is pleased to offer a full sizing service to specify the air to water heat pump system according to individual requirements.

Technical

Tel: 0844 892 3366
Fax: 01905 752 741

Renewables Helpline

Tel: 0844 892 4010
Email: renewable.energy@uk.bosch.com

Opening Times

Monday – Friday: 7.00am – 8.00pm
Saturday: 8.30am – 4.00pm

Notes

Useful numbers

Sales
Tel: 01905 752640
Fax: 01905 456445

Spare Parts
Tel: 01905 752576
Fax: 01905 754620

Technical Helpline (Pre & Post Sales)
Tel: 0844 892 3366
Fax: 01905 752741

Renewables Technical Helpline
Email: renewable.energy@uk.bosch.com
or telephone 0844 892 4010

Training
Tel: 01905 752526
Fax: 01905 752535

Literature
Email: literature@uk.bosch.com
or download instantly from our website
or telephone 0844 892 9800

Customer Service

Engineer Appointments
Email: appointment.worcester@uk.bosch.com
or telephone 0844 892 3000

Enquiries
Email: service.mailbox@uk.bosch.com
or telephone 0844 892 3000

Guarantee Registration
To register your Worcester guarantee,
please visit our website or
telephone 0844 892 2552

Calls to the listed 0844 numbers are charged at up to 3 pence per minute from BT land lines. Calls from mobiles and some other networks may vary. Calls to and from Bosch Thermotechnology Ltd may be recorded for training and quality assurance purposes.

www.worcester-bosch.co.uk

In partnership with energy saving trust™

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Bosch Group
Worcester, Bosch Group,
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Worcester, WR4 9SW